

### 3.3 Logarithmic Functions and Graphs Homework

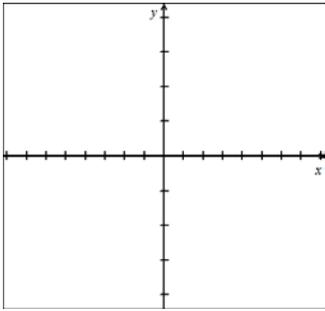
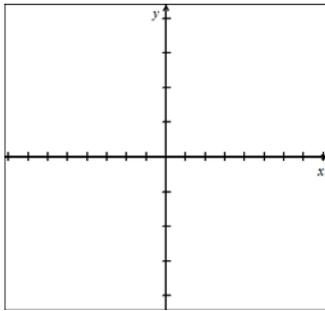
Problems 1 – 15, evaluate each expression without using a calculator.

1. $\log_2 64$	2. $\log_{64} 8$	3. $\log_5 1$
4. $\log_3 \sqrt{3}$	5. $\log_2 2$	6. $\log \frac{1}{\sqrt{10,000}}$
7. $\log_6 \frac{1}{\sqrt[5]{36}}$	8. $\ln e$	9. $\ln e^{-7}$
10. $\ln \frac{1}{e}$	11. $\ln 1$	12. $\ln \frac{1}{\sqrt{e^5}}$
13. $10^{\log 9}$	14. $6^{\log_6 5}$	15. $e^{\ln \sqrt{3}}$

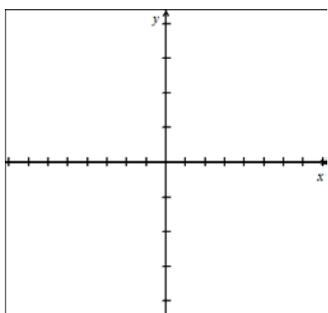
Problems 16 – 21, use a calculator to evaluate, if possible, to the nearest thousandth place.

16. $\log 12.34$	17. $\log(-100)$	18. $\log 0.987$
19. $\ln 8.92$	20. $\ln 0.765$	21. $\ln(-0.5)$

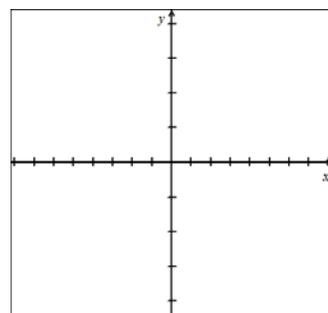
Problems 22 – 25, sketch each graph and describe the transformation from the parent function.

<p>22. <math>g(x) = \log(x + 1)</math></p> 	<p>23. <math>f(x) = \log(2 - x)</math></p> 
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24.  $f(x) = \ln(x) + 2$



25.  $h(x) = -\ln(x - 1)$



Problems 26 – 29, use a graphing utility to graph each function. Then, analyze.

26.  $f(x) = \log(x - 3)$

Domain:

Range:

Continuity:

Increase/decrease:

Symmetry:

Boundedness:

Extrema:

Asymptotes:

End behavior:

27.  $g(x) = \ln(4 - x)$

Domain:

Range:

Continuity:

Increase/decrease:

Symmetry:

Boundedness:

Extrema:

Asymptotes:

End behavior:

28.  $h(x) = 2 \log(x) - 3$

Domain:

Range:

Continuity:

Increase/decrease:

Symmetry:

Boundedness:

Extrema:

Asymptotes:

End behavior:

29.  $f(x) = -\ln(x + 3) - 4$

Domain:

Range:

Continuity:

Increase/decrease:

Symmetry:

Boundedness:

Extrema:

Asymptotes:

End behavior:

Problems 30 – 32, solve.

30. The wind speed  $s$  (in miles per hour) near the center of a tornado is related to the distance  $d$  (in miles) that the tornado travels by the equation  $s = 93 \log d + 65$ .

- A. A tornado whose wind speed was 270 miles per hour struck a town in Oklahoma. How far did the tornado travel?

31. Mr. Craig's students took a PreCalculus test and then tested every month with a similar exam. The average scores for class can be modeled by  $f(t) = 80 - 17 \log(t + 1)$  for  $0 \leq t \leq 12$ , where  $t$  is the time in months.

- A. Find the average score of students on the original test,  $t = 0$ .

- B. Find the average score after 6 months.

32. The Richter scale is used to measure earthquakes. The magnitude of an earthquake is modeled by the equation  $R = 0.67 \log(0.37E) + 1.46$  where  $E$  is the energy in kilowatt-hours, released by the earthquake.

- A. How many kilowatt-hours of energy is released in an earthquake that measures 8.5 on the Richter scale?

- B. Find the magnitude of an earthquake that releases 15,000,000,000 kilowatt-hours of energy.